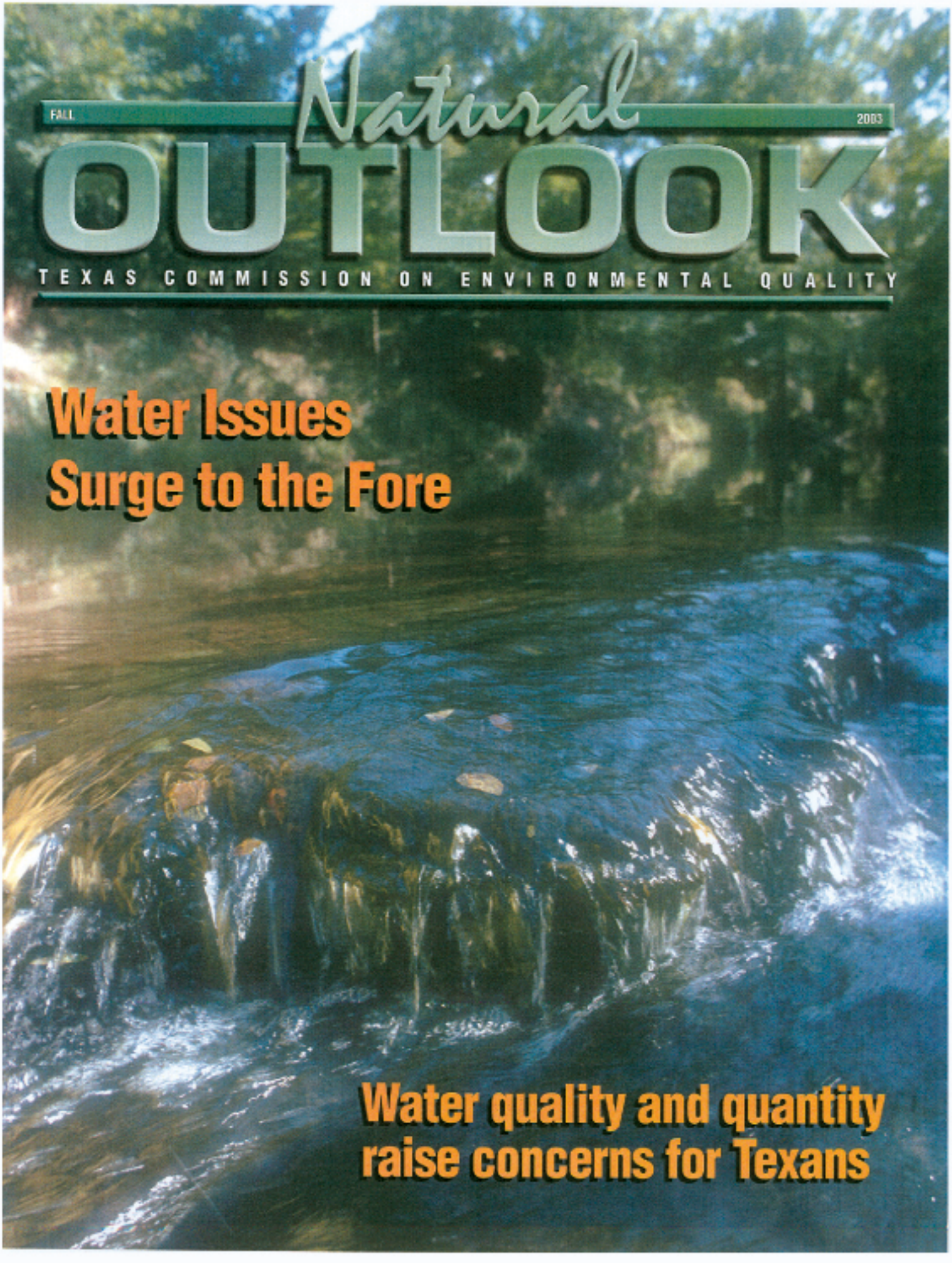
FALL
2003
Natural
OUTLOOK
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Water Issues
Surge to the Fore
Water quality and quantity
raise concerns for Texans

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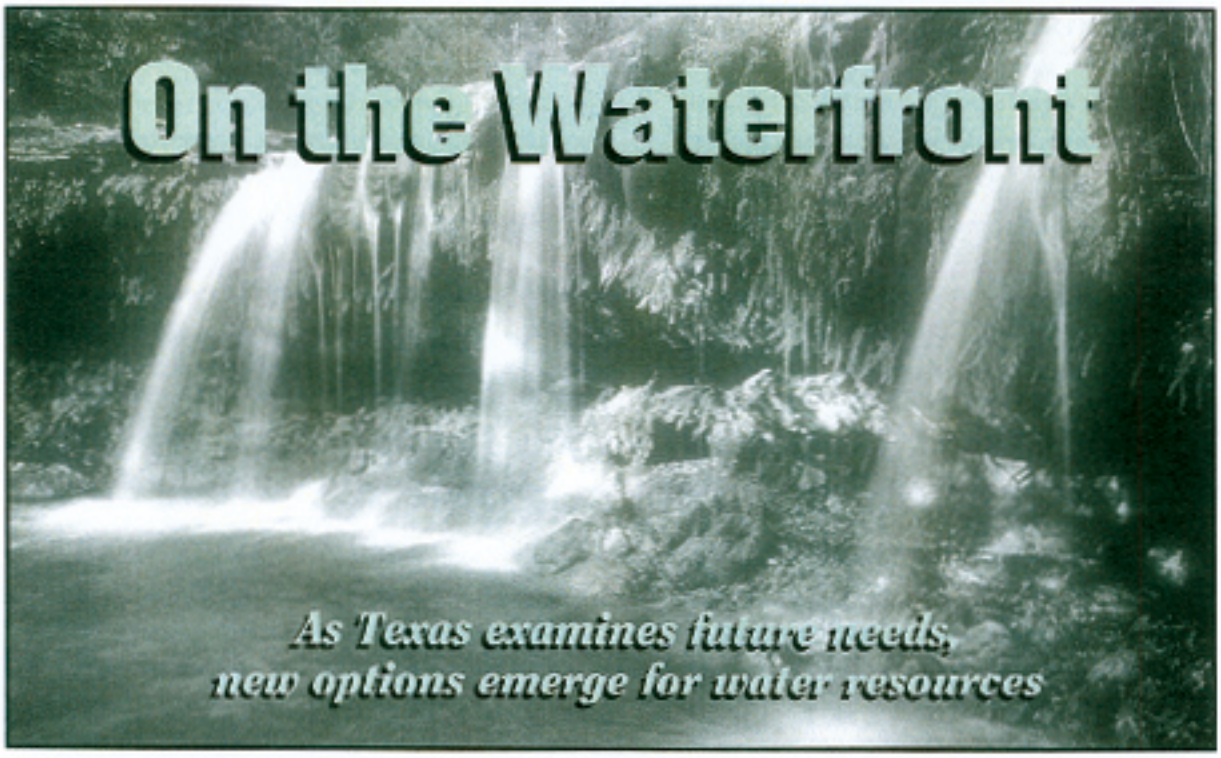
Natural OUTLOOK

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Informing Texans about important natural resource issues

Photo by the Texas Department of Transportation

Cover: Texas has nine major aquifers, 15 major river systems, and more than 11,000 named streams. Yet the demands on water resources spell a growing problem. Photo by the Texas Department of Transportation



On the Waterfront

As Texas examines future needs, new options emerge for water resources

Ten years of drought and then it floods. That's been the story in recent months along the Texas border. Heavy rains in September and October led the normally meager Rio Grande to crest at almost 24 feet above sea level in Brownsville—surpassing the usual 4.1 feet. Weeks of saturating rains interrupted a long dry spell, causing heavy flooding in several border communities.

Welcome to Texas, where much of the state can be described as arid land occasionally punctuated by floods.

Planning for water needs under these conditions is anything but easy. But while Texas weather remains unpredictable, other state forecasts are more reliable, such as continued population growth.

The number of Texans is expected to almost double—from 21 million in 2000 to 40 million in 2050—resulting in a corresponding jump in demands on water supplies.

However, the volume of water available from existing sources will likely decline, leaving Texas with insufficient water to supply people and industry—unless more resources are developed.

Legislators, state agencies, and water specialists are analyzing how Texas can get through the coming decades with its natural resources in tact and sufficient water available to fuel the economic engines. Consumers will play a role, too, by changing the way they use this natural resource.

Natural Outlook takes a look at some of the leading water issues to surface so far this decade.

Planning: Round 2

Compiling a master water plan began in the late 1990s with 16 regional planning groups and the Texas Water Development Board (TWDB) evaluating how water was being consumed in Texas and what would be needed over the next five decades.

The regional groups, drawing heavily on public participation, looked at a range of possibilities to stem predicted shortages, such as reducing demands on water resources, developing more water suppliers, acquiring more water, and encouraging conservation and reuse.

One of the key findings was that drought conditions, under current scenarios, could leave Texas municipalities, manufacturers, and agricultural interests short of water by 2.5 million acre-feet a year. Looking ahead to 2050, planners estimated a drought-related shortfall could swell to 7.5 million acre-feet a year—if nothing is done to boost water supplies.

Following years of public hearings and meetings, the regional groups' findings and recommendations were compiled into the State Water Plan, which now serves as the basis for deliberations concerning long-range planning.

In accordance with legislation that requires water planning to be updated every five years, a second round of water planning has begun as the regional planning groups reconvene to examine new census data and water management strategies. The TCEQ will help by providing technical assistance and its water availability models.

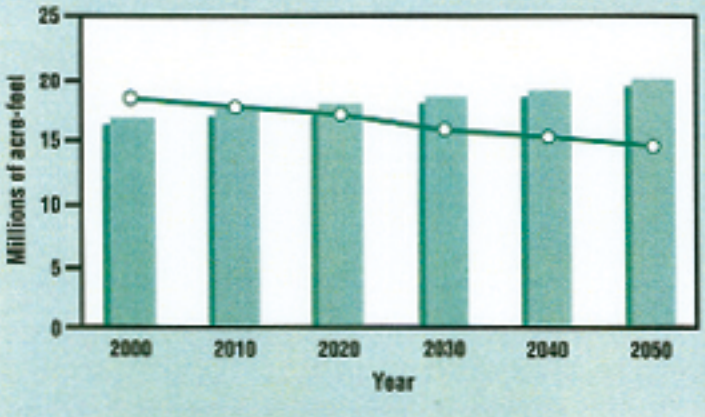
The regional recommendations will be issued in 2005. The TWDB will incorporate them in a revised State Water Plan due for completion in 2007.

Conservation Gains Support

Water conservation has long been considered one of the most cost-effective ways of meeting long-term water needs, but previous state policies on conservation were deemed fragmented and lacking in focus.

An assessment of water conservation, prepared last year by the TWDB and the Texas State Soil and Water

Drawing Down Water



While total water supplies are expected to drop in the coming decades, the needs of municipalities, industries, and some aspects of agriculture will expand. An estimated 17.8 million acre-feet (AF) of water was available in 2000, which exceeded the overall demand of 16.9 million AF. But by 2050 the availability of 14.5 AF of water could substantially lag behind the expected demand of 20 million AF. State planners are studying ways to keep pace with the escalating needs for water resources.

Projected water demands from municipalities, industry, and agriculture

Projected water supplies from existing sources

Note: Water demands include the estimated needs of industry (manufacturing, power generation, and mining); agriculture (irrigated crops and livestock); and municipalities. Analyses show that available water supplies will drop as aquifer levels decline and sediment fills storage space in rivers and lakes.

Source: Texas Water Development Board

Conservation Board, concluded that "additional water conservation is possible and necessary."

While the 16 regional groups acknowledged the importance of conservation, they did so with varying degrees of enthusiasm. The Legislature responded by declaring that conservation projects should be identified in all the regional plans.

Lawmakers took another step in 2003, saying the planning groups will consider conservation strategies for all identified water needs before looking at any other strategies. If a regional group fails to make any conservation recommendations, it will have to explain why.

Acknowledging the role conservation plays in long-term savings, the Legislature also formed the Water Conservation Implementation Task Force.

Led by the TWDB, the task force has a wide-ranging membership representing such categories as state and federal agencies, municipal utilities, industry, agriculture, groundwater districts, and environmental groups. The TCEQ also is a member.

The panel is charged with recommending optimum levels of water-use efficiency and conservation throughout the state. To that end, members will focus on:

- identifying best management practices for efficient water use by municipal, industrial, and agricultural users, and evaluating the associated costs and benefits;
- evaluating the implementation of water conservation strategies recommended in regional and state water plans;
- considering the need for a public awareness program on water conservation;
- studying the proper role, if any, for funding incentives;
- advising the TWDB and the TCEQ on a standard method of reporting and using per-capita water-use data, and establishing per-capita water-use targets and goals; and
- evaluating the appropriate state oversight and support of conservation initiatives adopted into law.

By November 2004, the task force is expected to issue a guide to best management practices, which can be used by regional water planning groups and municipal utilities. Final recommendations to the Legislature are due in January 2005.

The amount of water needed in rivers, streams, and coastal bays to support fish and wildlife habitat has emerged as a hotly debated issue. Many parts of the state depend on these flows to support the local economy—for example, income generated through fishing, hunting, and tourism.

The competition for available water continues to escalate as municipalities, industries, and agricultural irrigators vie for water coursing through the state's rivers and streams. Mother Nature complicates the scenario when rainfall falls below normal levels.

Texans need permission—in the form of a permit—to draw water from rivers, streams, lakes, and estuaries. Some of the exceptions are water used for domestic and

Timetable for Priority Instream Flow Studies

- Lower Guadalupe River (2003—2004)
- Lower Brazos River (2003—2005)
- Lower San Antonio (2003—2006)
- Middle Trinity River (2003—2007)
- Lower Sabine River (2004—2009)
- Middle Brazos River (2005—2010)

livestock purposes or wildlife management. Applicants must show they will use the water for beneficial purposes and not waste it.

As the issuer of water rights for surface water, the TCEQ was authorized in 1985 to consider the impact on environmental flows when deciding requests for new water rights and some types of permit amendments. Provisions to protect the environment are included as special conditions in water rights permits.

Debate over water rights for environmental uses will continue through the newly formed Study Commission on Water for Environmental Flows, created this year by the Legislature. The study commission, which is appointed by lawmakers, will study the broader picture: issues such as how Texas should provide water for the environment, the economic benefits of doing so, and the best balance for water needs in the future.

The results of the study could mean changes to the permitting process. The TCEQ will be a member of the study commission.

Meanwhile, the TCEQ, the TWDB, and the Texas Parks and Wildlife Department have launched instream flow studies of priority river segments. Scientists are examining the interdependence of the physical, chemical, and biological features of six rivers and how these features can be used to measure the overall health of river systems.

The studies, which were commissioned by the Legislature in 2001, will be completed by 2010.

With 360 miles of coastline, Texas is a candidate to enter the business of desalinating seawater—a process that strips salt and other minerals from ocean waters to make it drinkable. Recent improvements in membrane technology have begun to lower production and energy costs.

Florida and California are already moving to tap this water supply option. A seawater desalination plant in Tampa Bay, which began operating this year, expects to produce 25 million gallons a day (mgd). The Metropolitan Water District of Southern California has spent several years exploring desalination options and the feasibility of building as many as five plants—from San Diego to Los Angeles—to turn waters from the Pacific Ocean into a safe drinking source.

Texas has about 100 desalination plants operated by municipalities or industry. All are inland operations used to treat brackish water (water that is somewhat salty and unappealing in taste).

Now the state's attention is turning toward the Gulf of Mexico, as growing population centers along the coast demand more from existing water resources. After evaluating 13 proposals to build facilities that desalt seawater, the TWDB has narrowed the contenders for financial assistance to three. All would augment local water supplies through reverse osmosis, a method of membrane filtration.

The proposed projects are:

Freeport: Located at the Dow Chemical complex, this plant would produce 25 to 50 million gallons a day (mgd) of drinkable water. Poseidon Resources Corp. would develop the project, and the Brazos River Authority would distribute the product water to wholesale customers.

Corpus Christi: City owned and operated, this plant would produce 25 mgd from both seawater and brackish groundwater.

The Lower Rio Grande Valley: This joint project would be run by the Port of Brownsville, the Brownsville Public Utilities Board, and the Southmost Regional Water Authority. It also predicts a yield of 25 mgd.

Each project applicant has received a $500,000 state grant to help prepare regional water facility plans focusing on seawater desalination. The communities will analyze the need for a local project and estimate

potential costs. The regional evaluations are due to the TWDB in mid-2004.

While the TCEQ is not participating in the start-up project, it will have a role if any plants go into production.

If the treated water is to be used as drinking water, according to Tony Bennett of the TCEQ's Water Supply Division, "we will have to review all plans and specifications and pilot plant data. This is the same for any innovative treatment process. The operating plant would also have to meet all chemical, physical, and microbial standards for drinking water."

There will be disposal issues, too, because stripping salt from seawater produces a concentrated brine. "There are several disposal options, such as sending the brine back to the bay or sea or into the open waters. Another is underground injection," he said.

The TCEQ would evaluate the proposed disposal method chosen by any plant. Approval of any discharge or disposal permits is necessary before a facility begins operation.

Finally, depending on where the seawater was drawn from, the TCEQ would have to consider permitting issues relating to the withdrawal of water from the bay or estuary area. "This would get into the issue of water rights," Bennett said. "Just as power plants and industrial facilities use seawater for cooling, the withdrawal of water along the coastline represents a use of state waters and would need to be permitted."

Already saddled with drought much of the last decade, Texas communities along the border were dealt continued setbacks when Mexico failed to honor the terms of a 1944 water-sharing treaty.

The agreement entitles the United States to one-third of the water entering the Rio Grande from six river systems south of the border. Specifically, the United States is entitled to a minimum average of 350,000 acre-feet per year within five-year cycles.

Texas maintains that since 1992 Mexico has failed to meet its obligations for making minimum deliveries. TCEQ calculations show the Mexican debt stands at almost 1.4 million acre-feet.

Rio Grande Watershed

Much of the debate over treaty obligations has focused on Chihuahua, where the sizable Rio Conchos is supposed to discharge annual allotments into the Rio Grande. Texans have charged the Mexican state with hoarding water for its own use. As a result, levels at the international reservoirs of Amistad and Falcon dipped to unusually low levels in recent years, compounding conditions caused by drought.

The agricultural industry in the Lower Rio Grande Valley says the withholding of water from the Rio Grande has been economically devastating. Growers of irrigated crops rely on releases from the Amistad and Falcon reservoirs for affordable water.

A Texas A&M University study has estimated that Mexico's water debt translates into an economic loss of $400 million a year in terms of lost crop value, business activity, and jobs.

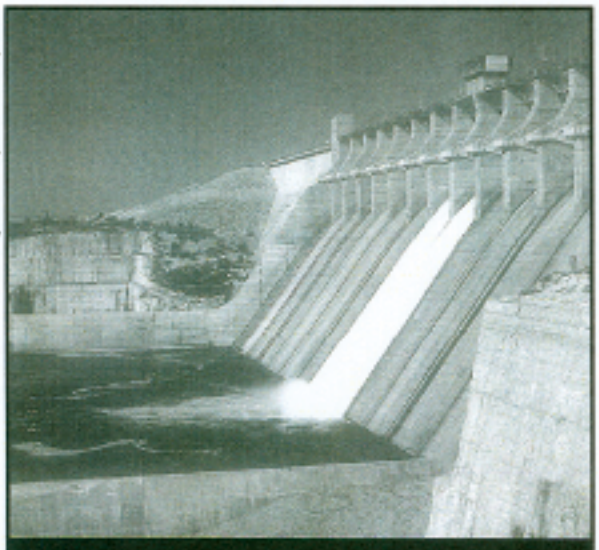
Federal officials have been negotiating with their counterparts in Mexico for several years, but with limited success. Texas is not a party to the international treaty and has no legal standing in the dispute.

In the past, Gov. Rick Perry has suggested that if diplomacy fails to correct the treaty deficit, the United States should consider withholding regular releases to Mexico from the Colorado River.

He noted that recent studies estimate the water stored in Chihuahua reservoirs doubled from 2002 to 2003, reaching 1.1 million acre-feet.

Meanwhile, municipalities and agricultural interests along the border are moving to make the most of available supplies. They welcomed news that the North American Development Bank will award a $40 million matching grant to 20 projects on both sides of the border. Fifteen of those projects are in Texas, representing $25.6 million to finance projects aimed at water conservation and more efficient water transfers.

Photo by the Texas Department of Transportation



The huge Amistad Dam, located on the Rio Grande upstream from Del Rio, stores much of the surface water released for use by cities and farmers. It also sends water downstream for storage at Falcon Dam, near Zapata.

definition

An acre-foot of water would cover an acre of land with one foot of water. It also represents about 326,000 gallons of water.

As Texas delves into water options for a fast-growing population, policy makers are also testing the potential of various alternative strategies.

Agriculture irrigators, traditionally the largest users of fresh water, are having to rethink some of their practices. Already some have converted to dryland farming, while others are looking at using different crop varieties, changing tillage methods, metering irrigation water use, and lining irrigation canals to improve water delivery.

Another problem plaguing water users is the proliferation of nonnative aquatic weeds. Research continues on solutions to problems caused by weed infestations in lakes and rivers, including the Rio Grande. The weeds form dense mats of vegetation that can degrade fish and wildlife habitat and interfere with recreation.

State agencies also are researching ways to better manage groundwater and replenish reservoir storage capacity lost to sedimentation.

Developments on all these issues will merge in 2005 as lawmakers take up long-range water planning in the next regular session.

Coming Full Circle

New commissioner returns to agency that launched his government career

When Larry R. Soward has a job to do, he sizes up the task at hand and plunges in with a determination to take no more time than necessary.

That no-nonsense attitude explains how he finished college in a little more than three years, blazed through law school in 26 months, then tackled a series of legal and administrative jobs in state government that earned him increasing responsibility and visibility.

It's also one of the attributes that led to Soward's selection for a position he describes as his "dream job." This fall, Gov. Rick Perry nominated Soward to a six-year term as a TCEQ commissioner.

"I started my state career as a hearings examiner at the old Texas Water Quality Board, which preceded the TCEQ," Soward recalled. "I fell in love then with the agency and the subject matter, so to sit as one of three commissioners of the agency I started at is a dream fulfilled. I'm very excited to be here."

Government veteran Larry R. Soward has begun serving a six-year term as a TCEQ commissioner. A lawyer by training, he has worked in high-level administrative and legal positions at several state agencies. In all, Soward has accrued 28 years of experience with the state.

The 54-year-old brings years of experience in government and the environment. He spent more than 12 years at the Texas Water Quality Board, later renamed the Texas Water Commission, where he began by conducting adjudicative public hearings in all areas of the agency's regulatory responsibilities. A series of advancements led him to the office of executive director from 1985 through 1987.

Soward went on to serve in executive management at the Public Utility Commission, the Department of Agriculture and the General Land Office. He spent most of 2003 on the staff of Lt. Gov. David Dewhurst, managing the divisions of administration, research, budget, constituent correspondence, and intergovernmental affairs.

Admittedly, it's been a long journey for Soward, who was the first in his family to attend college. He was born into a family that farmed in North Texas near the Red River. The basic lifestyle taught him to appreciate the finer things in life, he says, recalling, "We didn't have indoor plumbing until I was five."

While attending public schools in Carrollton, Soward began thinking about becoming a teacher. But spending time

In Brief: Larry R. Soward

Education

University of Texas at Austin, Bachelor of Arts
University of Texas School of Law

Employment

Texas Water Commission, 1975-1987
Environmental law practice, 1988-1990
Public Utility Commission, 1990-1992
Texas Department of Agriculture, 1992-1998
General Land Office, 1999-2002
Lieutenant Governor's Office, 2003

with an uncle, who loved to spin stories about his years as a lawyer and supreme court justice in Oklahoma, led the young student to become fascinated with the law. At the University of Texas at Austin, he majored in mathematics. He completed UT law school in 1974.

Soward's professional experience allowed him to watch the evolution of environmental regulation and protection in Texas. Dealing with natural resources was much simpler more than two decades ago, he remembers.

"There weren't as many federal programs then—with all the complexity that they bring—and on the state level environmental issues were still very basic. Not that many people were openly concerned about the environment, and you didn't have the pollution that you do today with the extent of development Texas has had. So rather than having whole communities or environmental groups getting involved in issues, it was usually individuals who lived downstream from or near a pollution source, or folks who wanted competing water rights or uses."

By contrast, environmental issues today are immersed in state and federal programs and often generate extensive public debate.

"All that's evidence that we've grown into a state that is extremely diverse—both as to our huge population and our business and industry. We're also a state with a rich ecology and a multitude of regional issues, so you can see this has become a very complex arena."

Soward says he brings to the commissioners' office a steadfast belief that Texas can, and must, strike a balance between economic development and growth and sound protection of its natural resources and environment.

"The reason people want to live here is because of the quality of life we enjoy. As we see more people moving to Texas and more businesses being attracted here, this growth really can go hand in hand with environmental protection."

The key is to bring all viewpoints into discussions, he says, adding, "That's my role—to look at all aspects of every issue."

People who have worked with Soward say his desire to be exposed to all viewpoints and available information shows up in his work habits.

"Without a doubt, I am detail oriented," he allows. "I'm also impatient when it comes to needlessly dragging things out. That's how I felt about college: why take four years to do something when you can do it in three?"

Soward further admits having "orange blood" when it comes to sports. He's a UT fan during football, baseball, and basketball seasons. And on many weekends he can be found in the nursery of his favorite home improvement store. After filling his downtown condominium with plants, he glassed in the balcony to accommodate the full collection, which numbers more than 100 containers.

A current events buff, he keeps his office TV tuned to an all-news network during the day. "I don't like surprises," he says. "I like to know what's going on."

With Soward's experience in government affairs and environmental issues, he'll likely stay ahead of the curve.

Changes on the Commission

Starting this fall, TCEQ commissioners have a new presiding officer.

Commissioner Kathleen Hartnett White was tapped by Gov. Rick Perry to head up the agency's three-member commission. White, who joined the TCEQ two years ago, succeeds outgoing Chairman Robert J. Huston.

Newcomer Larry R. Soward was appointed to the commission in October. He joins Commissioner R.B. "Ralph" Marquez, who has been a commissioner since 1995.

The trio is responsible for establishing agency direction and policy and for making final determinations on contested permitting and enforcement matters.

The appointments, which require consent of the Senate, are for staggered six-year terms.

The Health of Texas Waters

Revamped report provides more information on water quality

The TCEQ's biennial report on the condition of Texas water bodies is being presented in a more comprehensive manner. The report, which is available online, also includes an easy way for Texans to check the water quality status of more than 700 lakes, rivers, and streams.

The *2002 Draft Texas Water Quality Inventory and 303(d) List* combines two separate reports required under the federal Clean Water Act: the 305(b) water quality inventory and the 303(d) list of waters that do not meet the state's surface water quality standards due to contamination or other problems.

The new format also assigns all bodies of water to one of five categories based on levels of water quality. These rankings show how close waters come to meeting their "designated uses," such as swimming; a source for drinking water (human use), fishing and oyster harvesting; and a healthy environment for fish and other aquatic species.

The consolidated report lists the status of streams, reservoirs, estuaries, and near-shore waters in the Gulf of Mexico, as well as the agency's plans for dealing with existing water quality problems. Impaired water bodies are usually assigned to the Total Maximum Daily Load (TMDL) Program to determine the sources and causes of pollution and to develop cleanup plans.

New Classifications

The revamped report was prompted by the Environmental Protection Agency, which recommended that states use the new format to better characterize the status of waterways and more clearly explain cleanup strategies. Starting with the 2002 report, which awaits final approval from EPA, the TCEQ uses the following classifications to grade water bodies:

Category 1: Attaining the state water quality standards.

Category 2: Attaining some designated uses; insufficient information is available to determine whether the remaining uses are attained.

Category 3: Lacking sufficient data to determine whether any designated uses are attained (many small water bodies do not have water year-round and are not monitored regularly).

Category 4: Failing to meet one or more designated uses; a TMDL is not required or has been completed.

Category 5: Failing to attain water quality standards; a TMDL or some other action is required.

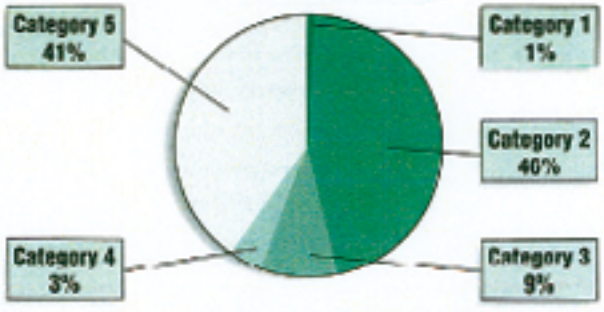
Of the 731 water bodies assessed in Texas in 2002, the 298 water bodies listed in Category 5 receive the most attention from the TCEQ. They are assigned to one of three subcategories (A, B, and C), depending on how the TCEQ intends to address individual water quality problems. For waters in Category 5A, TMDLs will begin in the next several years. Before TMDLs are scheduled for Category 5B waters, the water quality standards will be reviewed to determine whether uses and criteria are appropriate and accurate. Category 5C waters require additional monitoring to better characterize the water quality conditions. This information will determine whether the water quality standard should be reviewed or a TMDL should be scheduled.

Restoring the quality of water bodies to meet their designated uses is a long-term project, taking five years or more. A TMDL is prepared for each pollutant in an impaired water body and submitted to EPA for approval. The TMDL identifies the amount of pollutant a water body can safely handle. Then, the TCEQ develops an implementation plan detailing the necessary cleanup activities.

Implementation plans often address nonpoint source pollution, which can be traced to causes such as fertilizer, pesticides, leaking oil from cars and trucks, and construction debris. This pollution is often carried into creeks and streams by runoff.

Grading Water Bodies

The majority of assessed water bodies in Texas fall into either Category 2 (attaining some water quality standards) or Category 5 (not meeting water quality standards).



Category 5 Waters Get the Most Scrutiny

The bodies of water listed in this category do not meet water quality standards and may require cleanup. About four out of 10 of the assessed waters in Texas end up in this category. For many, a TMDL project is under way, while others are still being reviewed or data collection is ongoing.

Number of water bodies	Stream miles	Reservoir acres	Estuary sq. miles	Coastal waters sq. miles
298	4,695	546,554	381	3,879

Patrick Roques of the TCEQ says the number of water bodies assigned to Category 5 demonstrates that "Texas has significant challenges in addressing nonpoint sources, as well as some localized contamination issues that will require lengthy recovery. Some are persistent, long-term contamination problems."

The TCEQ works with a number of partners to keep tabs on water quality around the state. The Texas Clean Rivers Program and federal, state, regional, and local agencies collect and share relevant data.

Addressing water quality in a state this size can be a daunting task, admits Roques, who heads up the agency's Surface Water Quality Monitoring Program. "It's a challenge, but we feel we're monitoring water bodies with the highest human use and representing the most important resources for drinking water, recreation, and aquatic life," he said.

More Data Available

Roques said the task of reworking the 305(b) and 303(d) lists into a consolidated report has benefited the agency.

"Merging the two has helped our water programs focus on the most important water quality problems across the state and identify effective means of restoring water quality," he said. "The process of developing these categories has generated additional information about management plans for both agency programs and the public. We're providing more information than we reported in the past."

Now TCEQ staffers are preparing the 2004 integrated report. The draft will be submitted to the commissioners early next spring and to EPA by April.

Meanwhile, the 2002 report is maintained online. Users can find individual water body assessments in the alphabetical listings or group assessments by river basin. Summary information about each water body includes assessment results, a list of water quality monitoring stations, and any relevant TCEQ reports.

The TCEQ's *2002 Draft Texas Water Quality Inventory and 303(d) List* can be found at **www.tnrcc.state.tx.us /water/quality/02_twqmar/index.html**.

Recent water quality data collected by the TCEQ and local partners are available in a raw database format at **www.tnrcc.state.tx/water/quality/data/wmt /samplequery.html**.

To see the procedures and methodology being used to prepare the next report, go to **www.tnrcc.state.tx.us /water/quality/#hot**.

Indicators of Problems

The TCEQ conducts regular monitoring and assessments of surface waters to determine which water bodies meet the standards for their designated uses—contact recreation, drinking water, general water uses, and/or support of aquatic life. The most common impairments found during water sampling are as follows:

Bacteria levels: Elevated concentrations of fecal coliform, *E. coli*, and enterococci are signs that waste may have reached the waters from inadequately treated sewage, improperly managed farming operations, failing septic systems, or pets in urban areas.

Dissolved oxygen: Aquatic life requires oxygen concentrations at a certain level to survive and thrive. The inability to support diverse, abundant aquatic life is an indication of poor water quality.

Dissolved solids: High levels of dissolved solids, such as chloride and sulfate, can cause water to be unusable—or simply too costly to treat—as a source for drinking water.

Metals: High concentrations of metals such as cadmium, mercury, and lead threaten drinking water supplies and human health. Evidence of metals often shows up in fish tissue or in bottom sediments. Metals also can affect livestock and aquatic life.

Organics: Toxic substances from pesticides and industrial chemicals pose the same concerns as metals. DDT, for example, was banned in the 1970s, but remains in the environment.

Dealing with Atrazine

Water quality in the Aquilla Reservoir is restored with assistance from many helping hands

For the last six years, Aquilla Lake near Hillsboro has been the focus of concerns over drinking water. High levels of atrazine detected in 1997 and 1998 triggered projects to address agricultural sources of the herbicide by the TCEQ, the Texas State Soil and Water Conservation Board (TSSWCB), and other agencies.

Key Players

The TCEQ and the Texas State Soil and Water Conservation Board took the lead in implementing the atrazine reduction project and developing the TMDL.

The activities of the Texas Watershed Protection Committee were vital to the project. Headed by the Texas Department of Agriculture, membership includes representatives of the Blacklands Research Center, the Texas Cooperative Extension, the USDA-Natural Resources Conservation Service, the Brazos River Authority, the Texas Farm Bureau, as well as the TCEQ and TSSWCB.

Regional participants included the Aquilla Water Supply District, the Woodrow-Osceola Water Supply Corp., the Hill County Appraisal District, and the Hill County Blackland Soil and Water Conservation District. The U.S. Army Corps of Engineers also participated.

The campaign to restore water quality in Aquilla Lake drew multiple partners, ranging from a host of government entities to local farmers who work the land every day.

This fall, those partners agreed that their goal had been met—atrazine concentrations in the reservoir were down by about 60 percent, compared to the earlier readings. Today, annual average atrazine levels in Aquilla Lake are lower than those required for treated drinking water.

How was this problem resolved? The answer lies with a network of cooperative partners who worked to understand the problem and then do something about it.

Popular Herbicide

The fact that atrazine would be commonly used in the watershed surrounding Aquilla Lake came as no surprise. The area is populated with corn and sorghum producers who want an economical way to control weeds. About 63,000 acres, or 40 percent of the watershed, is in crop production.

Atrazine is known as an inexpensive, effective weed suppressant. But problems can arise when recently treated fields get a healthy rain shower. The herbicide is carried by runoff into ditches and streams, which eventually empty into the lake.

Atrazine is not a known carcinogen, but at high enough concentrations it interferes with the hormonal system of test animals, according to the Environmental Protection Agency.

Located 10 miles from Hillsboro, Aquilla Lake was built in 1983 for water supply, flood control, and recreation. It is the sole drinking water source for

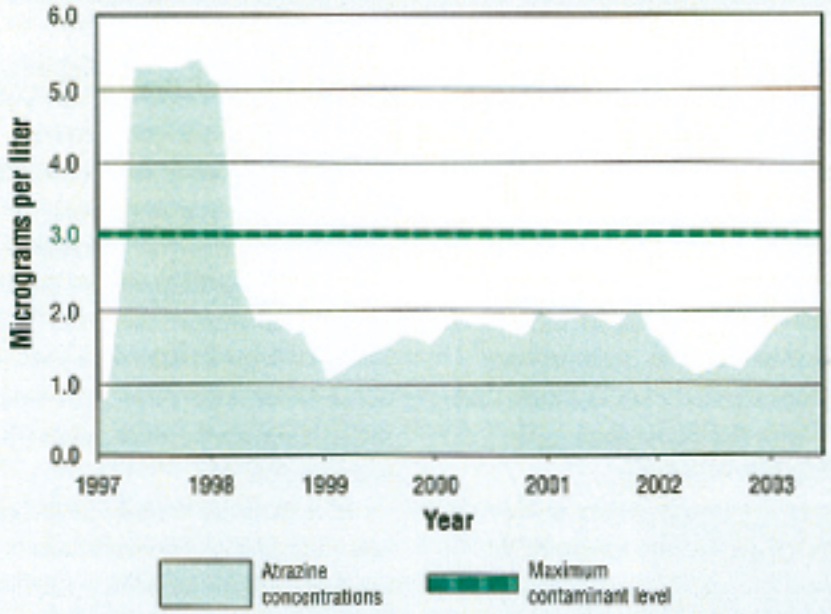
Aquilla Watershed

Located southwest of Hillsboro, Aquilla Lake serves as the drinking water source for Hill County residents.

Many of the participants in the pollution cleanup project live in the watershed (shaded).

Atrazine Levels in Aquilla Lake and in the Drinking Water

Running annual averages: February 1997 through February 2003



Under state and federal standards for drinking water, atrazine concentrations must be below the maximum contaminant level (MCL). The MCL for atrazine is a running annual average of 3 micrograms per liter or lower. High levels in 1997 and 1998 led to Aquilla Lake being listed as "impaired."

more than 18,000 residents of Hill County and a popular destination for swimmers, boaters, and fishermen.

The atrazine levels found in 1997 and 1998 led the TCEQ to list the lake as "impaired" and in need of cleanup. The agency initiated a total maximum daily load (TMDL) project to determine the amount (or load) of pollutant the lake could receive and still support its designated uses.

Also, the TCEQ's Source Water Assessment and Protection team conducted assessments and inventories to determine the origin of atrazine within the watershed. The team discovered more than 600 potential contamination sources, such as fertilizer and pesticide application sites. All this information was forwarded to the Aquilla Water Supply District to help residents protect water quality.

The TSSWCB led a coordinated effort to change agricultural practices that contribute to atrazine pollution in the lake. The agency worked with area producers and other stakeholders to implement "best management practices" for atrazine reduction.

The TSSWCB also worked with other agricultural agencies to provide training on safe pesticide application. These meetings reached hundreds of agricultural producers and led to an

Pollution Prevention

Here are some of the best management practices that helped minimize the amount of atrazine reaching the lake. A field of corn (1) is cultivated by working the herbicide into the soil, rather than just applying it on top of the ground, to reduce runoff and surface water contamination. Farmers also can plant filter strips of vegetation (2) next to the fields to help remove some of the sediment, organic materials, and pollutants that move downhill with rainfall runoff. A grassed waterway (3) is a means of directing the runoff downstream while removing pollutants at the same time. Without some or all of these strategies, much more atrazine would end up in the lake (4), which is a source for drinking water.

increased awareness of water quality in general.

Action at the Local Level

The primary responsibility for reducing atrazine fell to agricultural producers in the watershed.

A key factor was the coordination of activities and interested parties through the Texas Watershed Protection Committee, an independent body formed to address threats to several lakes from atrazine contamination.

Committee members developed educational materials on preferred herbicide and pesticide practices and invited speakers to forums on water quality topics. They also met with pesticide dealers to raise their awareness of the problem.

Area farmers took the initiative to re-examine their own growing practices—deciding, for example, to till herbicides into the soil rather than applying on the surface. After a year, about one-third of area farmers had adopted this strategy, which reduces runoff into waterways; two years later, participation neared 100 percent.

Model Established

The activities developed and implemented for the Aquilla watershed have also been used to lower atrazine pollution in several other watersheds, where atrazine levels were lower than Aquilla's but high enough to threaten sources of drinking water.

Monitoring by the TCEQ in the North Central Texas region shows that atrazine concentrations have dropped in Big Creek Lake, Joe Pool Lake, Lavon Lake, Lake Tawakoni, Marlin Lake, and Richland-Chambers Reservoir.

The Bardwell and Waxahachie reservoirs are still being monitored, but results so far indicate that in the next six months they will no longer be classified as "threatened." Little River will be monitored for another 12 months.

The success of this comprehensive, collaborative approach to reducing atrazine impairments and threats to sources of drinking water holds promise for future watershed projects.

Agricultural producers living in the Aquilla watershed responded effectively—with the assistance of state and federal agencies—to a water quality problem that had the potential to affect people's health and the environment.

The TCEQ's TMDL project served an essential coordinating function, helping to focus limited resources to meet water quality restoration needs.

A variety of best management practices for the prevention and reduction of atrazine pollution in surface water were developed and tested. These measures have been used effectively in 10 watersheds and can be used throughout the state to prevent further threats to surface water from atrazine pollution.

Contributing to this article:
Louanne Jones

definition

Best management practices are the methods determined to be the most effective, practical means of preventing or reducing pollution.

Farming Methods Get an Update

Corn and sorghum farmers in the Aquilla watershed were willing to alter traditional growing practices to help restore water quality.

Some of the most commonly used innovations for pollution prevention were:

Land cultivation. **Rather than spreading atrazine just on the surface to control weeds, farmers began tilling the herbicide into the soil during the annual application.**

Barriers. **Instead of plowing fields adjacent to waterways, growers planted perennial vegetation on that strip of land to slow runoff and filter out pollutants.**

Grade stabilization. **A wide range of structures was designed to stabilize the grade of water channels. This also slows erosion and deters gullies from forming. Also, retention ponds are sometimes built below these structures to detain runoff and allow for further removal of atrazine.**

Grassed waterways. **Channels (natural and constructed) that carry water were planted with perennial vegetation to slow runoff and help filter out pollutants.**

Terraces. **Earthen embankments, channels, or combinations of ridges and channels were built across slopes to prevent runoff.**

Western States Face Water Woes

Many states in the western half of the country hold the distinction of being the driest in the United States. But for more than a decade, that's been a primary direction of population migration—to the West.

The result is unprecedented demand on limited water resources. Fast-growing urban areas are beginning to compete with farms and ranches—the traditional users of water.

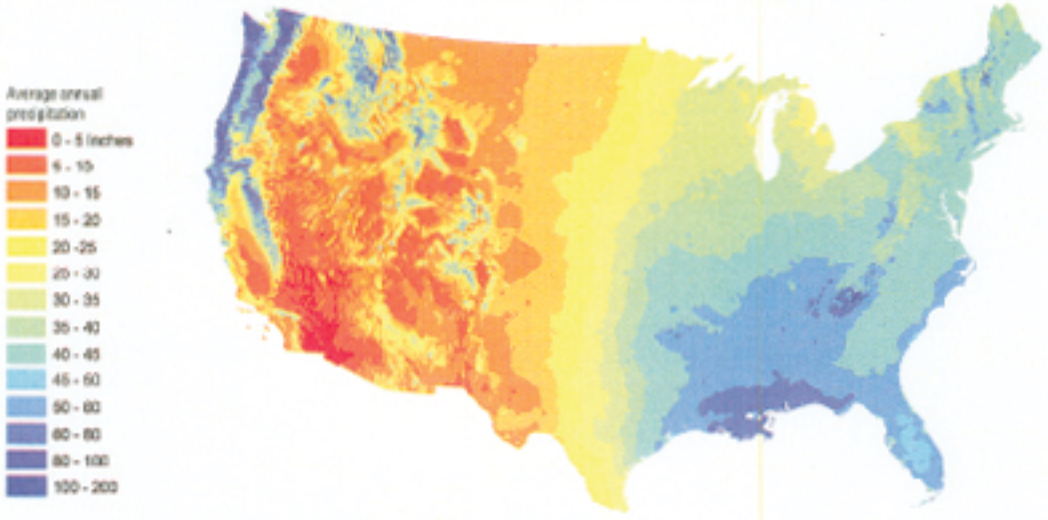
In the 1990s, movement accelerated to western states. Growth sizzled in Nevada (66 percent) and Arizona (40 percent). Not far behind were Colorado, Utah, Idaho, Texas, Washington, Oregon, and New Mexico, with growth in the 20-to-30 percent range.

The Department of the Interior has determined that current water supplies in parts of the West are inadequate to meet the future demands of cities, farming interests, and the environment.

Seeing the potential for conflicts over water availability, Interior officials have been holding conferences in several western states, including Texas, to examine the potential of chronic water shortages. The goal is to identify the watersheds facing the greatest potential risk.

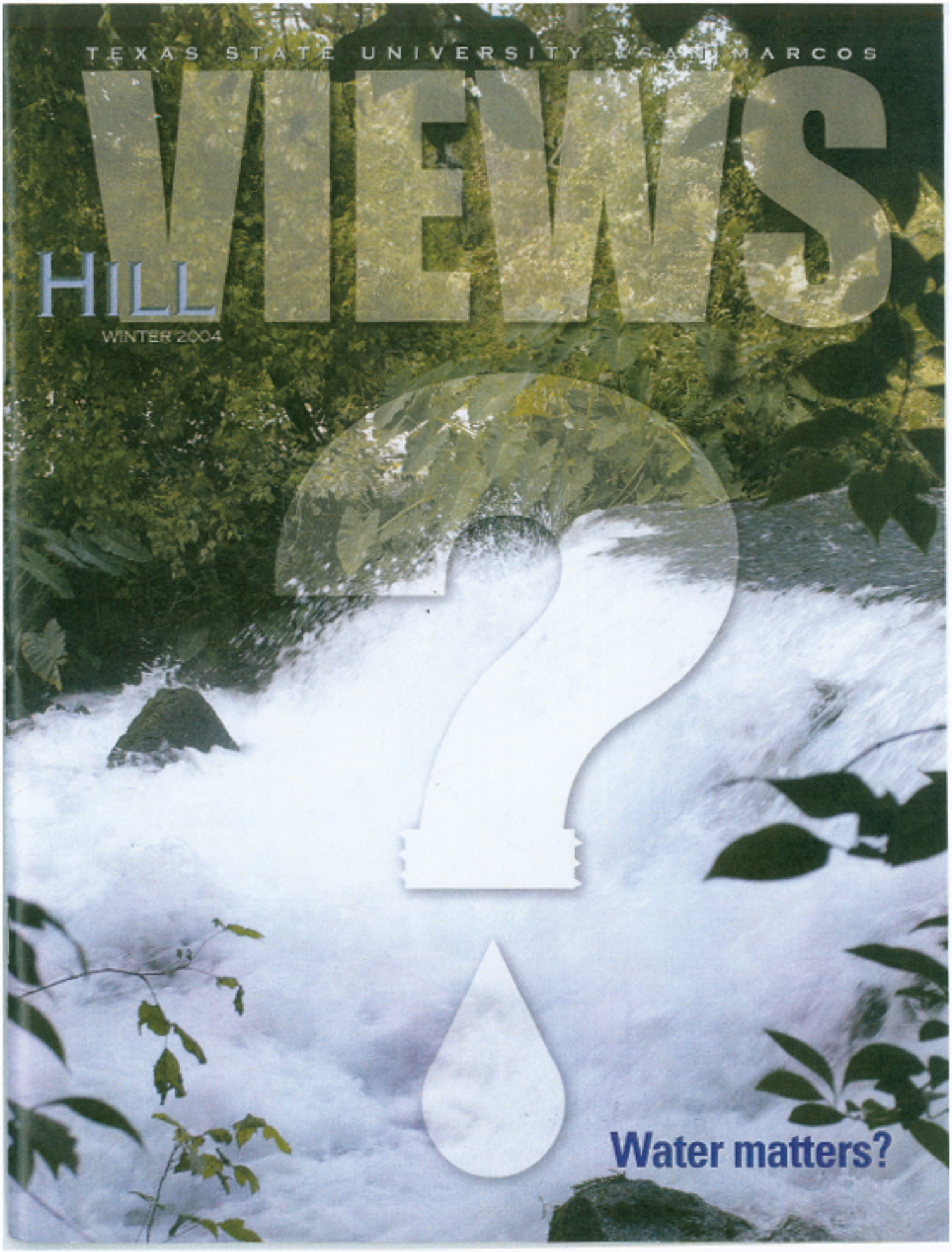
The federal agency is urging governors, local officials, and public interest groups to evaluate the most effective ways to address water shortages and to recommend cooperative planning approaches.

Annual Rainfall in the U.S.—1961 to 1990



Sources: U.S. Department of Agriculture and Natural Resources Conservation Service

Texas Commission on
Environmental Quality MC118
PO Box 13087
Austin TX 78711-3087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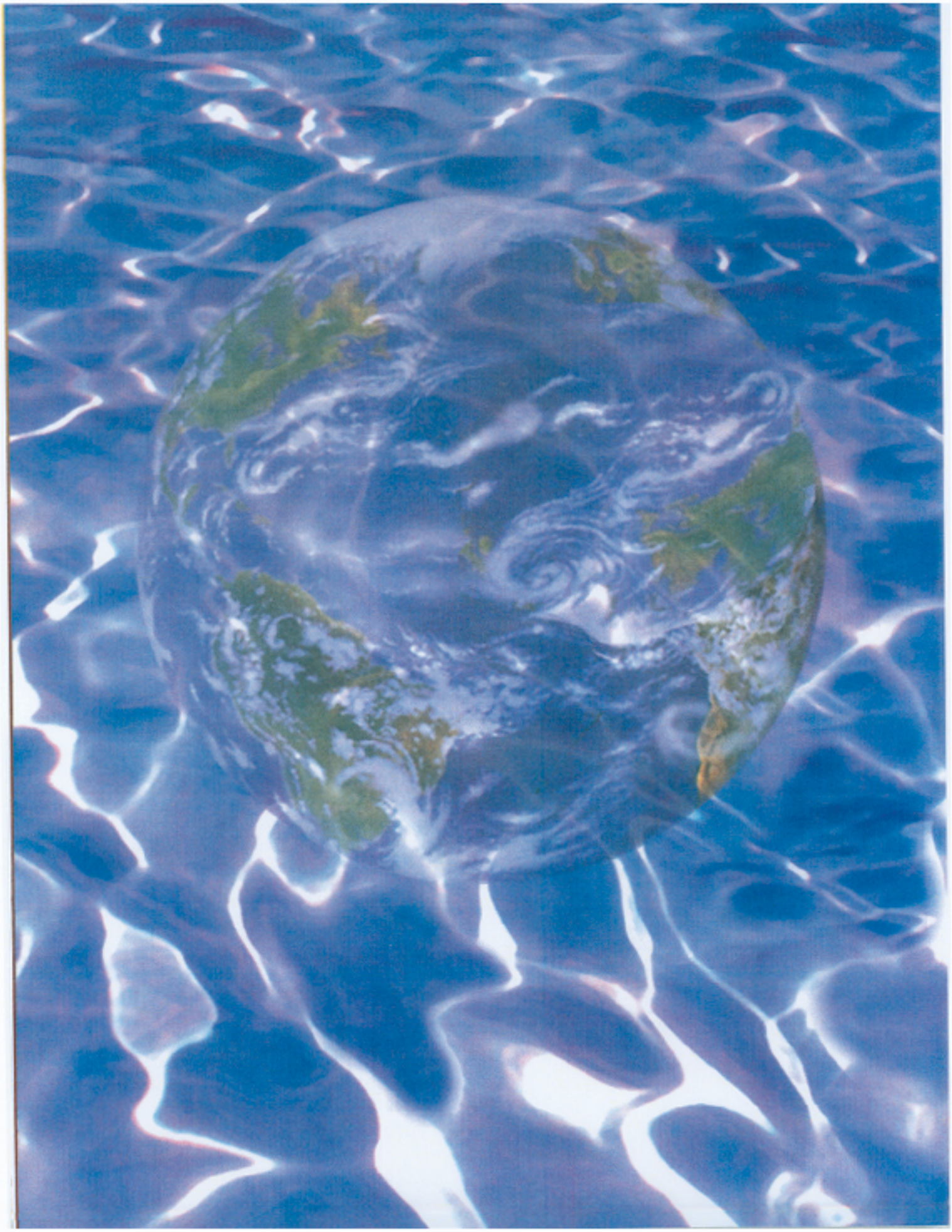

critical *crossroad for* WATER

A WAKE UP CALL

By Andrew Sansom

POINT OF VIEW

Earth is the water planet. In fact, 75 percent of the globe is covered with water. Water is the essential ingredient for all life and the reason why we, and all the other living things we share Earth with, are here. Interestingly, in spite of the great abundance of water, fully 99 percent of our supply is not available as it is either in the oceans or tied up in glaciers or polar icecaps. Thus, all terrestrial life on Earth is completely dependent on a very tiny portion of its greatest resource.

Here in Texas, for most of us, water has generally been fairly abundant and is the basis of our prosperity since Stephen F. Austin's colonists washed up on the beach in the 1820s. Texas is blessed with nearly 200,000 miles of rivers and streams and, at one time, had over 281 significant springs, including 31 major springs. Our state has 214 reservoirs built largely for the storage of water. As a result, through most of our history, the fact that we've had plenty of water has kept us from learning just how important it really is to us and how fragile our existence is when water starts to get scarce.

Benjamin Franklin never came to Texas, but his thoughts on water were a prescient description of what we went through during the 1990s. Franklin said, "When the well runs dry, we know the worth of water." In the last decade, our state suffered a drought which, in many respects, was much worse than that which devastated Texas in the 1950s.

In May 1998 San Antonio, whose water supplies are increasingly uncertain, received less than 8 percent of its annual rainfall. In fact, the period of April through June of that year was the driest in 104 years. Of the original 31 springs, only 17 remain today. Only two of the very largest springs, Comal and San Marcos, located on the Texas State University campus, remain.

We ended the 20th century in Texas with the stark realization that as many as 900 Texas cities will not have enough water by the year 2050 and our statewide need for water is expected to triple over that same period.

In the face of these startling realities, the Texas Legislature passed landmark legislation at the close of the decade that, for the first time, delegated water planning for the future to decentralized

groups across the state through a unique "bottom up" process. Additionally, for the first time, state leaders began to place limits on the historic "rule of capture," which, for nearly a century, has prohibited any regulation of groundwater use. More than anything else, we have finally begun to come to grips with the fact that big changes are coming in the way we manage and use our precious water resources if our quality of life and economic growth in Texas are to continue.

Today, entrepreneurs in true Texas tradition are devising schemes to move huge amounts of water across the state from the countryside to thirsty populations in our big cities. As 80 percent of the water in our state is currently used in agriculture, struggles between rural and urban interests are sure to come. At the same time, increasing demands for water will place unprecedented stresses on the environment as we face the very real prospect that some of our most beautiful and treasured rivers, like the Guadalupe, could go dry, and the magnificent natural treasures of the Texas Coast could wither for lack of freshwater. The Rio Grande stopped flowing into the Gulf of Mexico this past year, and that should be a wake-up call for all of us.

Texas is at a crossroads. The choices we make now will determine whether we will be able to meet our water needs to maintain our quality of life and protect our natural resources. Mark Twain said: "Whiskey is for drinking, and water is for fighting." If we are mindful of the limitations of our water resources and respectful of all of the many uses of water, including supplies for the environment, we can minimize the fighting and increase the probability that the best days of Texas are ahead. A sustainable water supply for our future is possible, but only if we work together. BY

San Marcos River

Texas State ideal place for aquatic doctoral

Texas State began its sixth doctoral program this fall with coursework leading to a Ph.D. in aquatic resources. The program is organized within the Department of Biology, but it is truly interdisciplinary in nature and utilizes the expertise of other departments, including Agriculture, Chemistry, English, Geography, Health Sciences, Philosophy and Political Science.

The goal of the program is to produce professionals well trained in aquatic science who can analyze aquatic resource problems and develop water policy to address those problems.

In support of the new degree program, Frank and Patricia Nelson have established a fund to provide fellowships for students seeking doctoral degrees in aquatic resources. To be eligible, students must have earned a master's degree and carry a minimum grade-point average of 3.5.

Texas State is an ideal university to house such a program because of its proximity to a variety of aquatic ecosystems, including the San Marcos Springs on the school's campus. With its acquisition of the springs in 1994, the university obtained stewardship of a unique ecosystem as well as a major aquatic educational and research center. Resources at the Aquarena Center include the Texas Rivers Center at San Marcos Springs and the Biology Department's Wetlands Restoration Project. The university is also home to the Edwards Aquifer Research and Data Center and the International Institute for Sustainable Water Resources.

The doctoral program in aquatic resources is the only science doctorate offered by a school in the Texas State University System. The university also offers three doctoral programs in geography and two in education.

For further information on the program, contact Walter Rast, director of the Texas State Aquatic Station, at 512.245.2284.

The International Institute for Sustainable Water Resources

Ensuring adequate supplies of drinking water is the most critical natural resource issue facing Texas in the 21st century, but until now, little has been done on a statewide level to address this issue.

In 2002, the International Institute for Sustainable Water Resources was established at Texas State to develop, promote and facilitate the holistic management of the state's waters – everything from rivers and lakes to wetlands, aquifers and bays. Ensuring their sustainable and equitable use is essential for long-term human and ecosystem water needs.

"Texans should be concerned about water because it's basically the source of all life – both economic and otherwise. And we're clearly running short," said Andrew Sansom, executive director of the International Institute for Sustainable Water Resources. "Many of our major cities in Texas are expected to be without sufficient supplies of water within the next 25-50 years."

The establishment of the institute at Texas State shows that water issues are taken seriously both by the state and the university. Texas State's pre-existing expertise made it the natural choice to spearhead the state's water-planning efforts. Pre-existing local and regional water resource entities couldn't take that big picture approach, and that is one of the biggest differences the institute will make. No single entity has provided the integrated perspective needed to effectively manage water resources for the future, and the institute was created specifically to address this shortcoming.

"There are a lot of competing interests," Sansom concedes. "The level and intensity of that competition is going to increase as populations grow and water supplies are stretched thinner and thinner.

"The thing we have to avoid is to serve any one of these interests at the expense of the other. We have to approach this with the idea that all of the interests are legitimate and need to work together to sustain availability," he said. "An institution that operates statewide, as we do, can understand, explore and find ways to proceed for all those interests."

Today, water planning and development activities in Texas focus on identifying water supplies needed for human, industrial and agricultural uses. If a projected shortfall exists between available water supplies and future water needs, the traditional approach has been to focus on developing new water supplies. Unfortunately, the assumption that existing and potential water supplies are inexhaustible simply doesn't hold up in the long run. The institute's operating philosophy does not exclude *new* development, but enhances it by facilitating the sustainable use of *existing* water supplies. The alternative – choosing to ignore the looming water problems facing the state – can only lead to future crises.

"The consequences would be that some of our major cities could well run out of water," Sansom said. "Just as equally disturbing, some of our rivers may run dry, like the Rio Grande has already done. Without action, this could happen to our other rivers up the coast.

"The Rio Grande is a real wake up call for us," he said. HV


Andrew Sansom